Non-Chromate Conversion Coating

A Research Effort of the United States Air Force Research Laboratory
Tyndall Air Force Base, Florida

The Problem

The US Air Force is using chromate coatings for corrosion prevention on weapons systems. Stringent environmental and occupational health regulations have come into effect for Air Force electroplating facilities. These regulations at the federal, state, and local levels are restricting pollutant discharges from the ALCs and force the cost of waste disposal to escalate.

Chromate conversion coatings contain hexavalent chrome, a known human carcinogen. Federal regulations mandate that these coatings be phased out of the US Air Force inventory within the next few years. A number of the weapon systems that AFMC and ASC/EMV are developing, repairing, and maintaining use chromate conversion coating for corrosion prevention on various aircraft parts. Unless a non-chromate conversion coating is developed as a replacement, US Air Force maintenance operations may be significantly curtailed due to environmental and occupational health regulations.

The Objective

The US Air Force desires to comply with the chromate conversion coatings Federal mandate by developing a conversion coating containing no chromium. A significant development effort has already been implemented to identify a replacement for chromate con-version coating for use with IVD aluminum by the Air Force Research Laboratory, Materials and Manufacturing Directorate, Airbase and Environmental Technology Division (AFRL/MLQ). In 1994, McDonnell-Douglas Aerospace was contracted to identify at least five nonchromate conversion coatings. Candidates were then downselected through testing, and a recommendation of one non-chromate conversion coating was made for demonstration and validation.

The Approach

On 26 April 1996, a contract was awarded to Arcadis Environmental Corporation. The goal of the Phase-II effort is to demonstrate and validate through testing, the candidate coatings recommended by McDonnell-Douglas. To date, five lots of test panels and a group of condemned components have gone through 1,344 hours (twice the MIL-C) requirement of exposure to neutral salt fog without visible red rust. The remainder of the Engineering and Manufacturing and Development (EMD) qualification testing of the coating and the validation and demonstration test are underway. In March 1998, the coating successfully complete the paint adhesion test. Three tests remain and are planned for completion by April 1999.

Benefits

When successfully completed and transitioned into the ALCs, this new non-chromate coating will reduce or completely eliminate chromate from the plating baths. This will eliminate large volumes of hazardous waste while dramatically reducing exposure of the workers to carcinogens. This elimination will save millions of dollars in treatment and disposal costs. It would also eliminate future liabilities, while ensuring continued operations without potential costly fines and shutdowns.

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